# Job requirements and recruitment of new employees

van Ours, J.C.; Ridder, G.

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# Job requirements and the recruitment of new employees

Jan van Ours

*Department of Economics, Free University Amsterdam, Amsterdam, Netherlands*

Geert Ridder

*Department of Economics, University of Groningen, Groningen, Netherlands*

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This paper presents an empirical analysis of the role of hiring standards used by employers for their job vacancies. Employers put more weight on educational requirements than on the level of work experience. Education and work experience are not substituted when hiring employees.

## 1. Introduction

Employers may use different hiring strategies in their search for new employees. To find suitable employees for specific jobs employers have to specify hiring standards. These hiring standards may or may not be applied stringently and may or may not be used as instruments to control the duration of the hiring procedures.

## 2. Job requirements and hiring standards

Jobs differ with respect to the level and type of skills needed for a satisfactory performance. Traditionally economists measure job performance on a one-dimensional scale: productivity. However, to have a certain level of productivity in a particular job a specific combination of e.g. formal education and work experience is needed, and the possibilities for substitution between the two may be limited. For this reason employers classify jobs by minimally required levels of education and work experience.

At first sight job requirements play a role similar to that fo reservation wages in the theory of unemployed job search. In job search theory the unemployed choose a reservation wage that characterizes the optimal strategy in a waiting game. However, the similarity between reservation wages and job requirements is superficial. In a companion paper [van Ours and Ridder (1990a)] we found that the sequential search model has little relevance for the search for new employees. Employers search non-sequentially; a pool of applicants is formed just after the vacancy has been posted, and employers select a suitable applicant from this pool. Hence, employers do not play a

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waiting game, but simply choose the best applicant that is available. Reported job requirements do not characterize the optimal strategy in a waiting game. Instead job requirements will be used to guarantee a satisfactory performance on the job. If the wage associated with a vacancy is given, as we will assume in the sequel, then an applicant will be suitable only if his (expected) revenue product exceeds the wage rate. Job requirements will be set so that this relation holds.

The job requirements may be used as an instrument to control the duration of the vacancy. It is possible that employers lower the job requirements if there is no applicant that satisfies them. This may be due to high costs associated with a vacancy that remains open for a long time. Below we shall test this hypothesis.

Education and work experience may be imperfect indicators of the characteristics that are important for a satisfactory performance in a job. First, we consider the case of just one job characteristic. Let $S^*$ denote the characteristic that really matters to the employer. We assume that the employer observes $S^*$. We do not observe $S^*$, but an indicator $S$. We have

$$S = S^* + V, \tag{2.1}$$

where $V$ is just the difference between the true and the observed level which is assumed to be known to the employer, but unknown to the analyst. All variables are expressed in the same units of measurement as $S$. The employer requires a minimum level $S^*_{min}$. Hence, the successful applicant must have a pair $(S, V)$ such that

$$S \geq S^*_{min} + V. \tag{2.2}$$

We observe the reported requirement on $S$ after a duration $t_1$. We assume that this reported requirement $S_{min}$ is

$$S_{min} = S^*_{min} + \mathrm{E}(V), \tag{2.3}$$

where the conditioning indicates that the employer makes an estimate of $V$.

Let us assume that an employer selects an employee from a pool of applicants that was formed just after the posting of the vacancy. Let $\lambda(t)$ be the intensity of the selection process, i.e. $\lambda(t)\,\mathrm{d}t$ is the probability that an applicant is hired in $(t, t + \mathrm{d}t)$ given that no decision has been made up to time $t$. Time is measured from the start of the vacancy. Note that $\lambda(t) = 0$ during the period in which the pool of applicants is formed. An applicant is characterized by a pair $(S, S^*)$. Given that an applicant is hired at time t, there are two possibilities:

$$S^* \geq S^*_{min}, \quad S < S_{min}, \text{ applicant is accepted, but does not satisfy } S_{min}, \tag{2.4a}$$

$$S^* \geq S^*_{min}, \quad S \geq S_{min}, \text{ applicant is accepted, and satisfies } S_{min}. \tag{2.4b}$$

Hence the vacancy can end in two ways as described by the events (2.4a) and (2.4b). This formulation leads to a competing risk model with cause-specific hazards given by

$$\theta_{NQ}(t) = \Pr(S^* \geq S^*_{min}, \quad S < S_{min})\lambda(t), \tag{2.5a}$$

if the new employee does not satisfy the formal requirement and

$$\theta_{Q}(t) = \Pr(S^* \geq S^*_{min}, \; S \geq S_{min})\lambda(t), \tag{2.5b}$$

if she does satisfy this requirement. In section 4 we shall estimate these cause-specific hazards and we shall consider

$$\frac{\theta_{NQ}(t)}{\theta_{NQ}(t)+\theta_{Q}(t)} = \Pr(S < S_{min} \mid S^* \geq S^*_{min}),$$

$$= \Pr\left(\frac{V-\mathrm{E}(V)}{\sigma_v} < \frac{(S-S^*_{min})}{\sigma_v} \,\middle|\, S^* \geq S^*_{min}\right), \tag{2.6}$$

i.e., the fraction of unqualified applicants that are hired. Note that (2.6) is 0 if $V$ has a degenerate distribution ($\sigma_v = 0$), and that (2.6) increases in $\sigma_v$, i.e. if $S$ becomes a poorer indicator of $S^*$. We shall use (2.6) to infer the quality of $S$ as an indicator of $S^*$. Moreover, if (2.6) decreases with the duration of the vacancy, then the hiring standard becomes less stringent for vacancies that have been open for a long time.

Of course, we may be more interested in the probability that an applicant who does not satisfy the formal requirement is hired, i.e. (2.6) with a reversal of the event and the conditioning event. This probability can be obtained from

$$\frac{\Pr(S < S_{min} \mid S^* \geq S^*_{min})}{\Pr(S < S_{min})} = \frac{\Pr(S^* \geq S^*_{min} \mid S < S_{min})}{\Pr(S^* \geq S^*_{min})}. \tag{2.7}$$

Hence, we need an estimate of $\Pr(S < S_{min})$, i.e. the fraction of applicants to the firm that do not satisfy the formal requirement. In principle, we can estimate the parameters of the distribution of $S$ from the observed $S$ from new hires. If $S^*_{min}$ and $\mathrm{E}(V)$ are constant over the duration, then the observed $S$ is a draw from the distribution of $S$ given $S-(V-\mathrm{E}(V)) \geq S_{min}$. By making an assumption on the distribution of $S$ and $V$ (we assume that they are stochastically independent), e.g. both are Normally distributed, we can estimate $\mathrm{E}(S)$, $\mathrm{Var}(S)$ and $\mathrm{Var}(V)$. We will not attempt this here.

Next, we shall consider the case of two indicators, e.g. formal education and work experience. Again we assume

$$S_j = S_j^* + V_j, \quad j = 1, 2. \tag{2.8}$$

The reported requirements are

$$S_{j,min} = S^*_{j,min} + \mathrm{E}(V_j), \quad j = 1, 2. \tag{2.9}$$

Note that correlation between the $S^*_{j,min}$, $j = 1, 2$, induces correlation between the reported standards. Given that an applicant is hired at $t$, there are four possibilities

$$S_j^* \geq S^*_{j,min}, \quad j = 1, 2, \quad S_1 \geq S_{1,min}, \quad S_2 \geq S_{2,min}, \tag{2.10a}$$

$$S_j^* \geq S^*_{j,min}, \quad j = 1, 2, \quad S_1 < S_{1,min}, \quad S_2 \geq S_{2,min}, \tag{2.10b}$$

$$S_j^* \geq S^*_{j,min}, \quad j = 1, 2, \quad S_1 \geq S_{1,min}, \quad S_2 < S_{2,min}, \tag{2.10c}$$

$$S_j^* \geq S^*_{j,min}, \quad j = 1, 2, \quad S_1 < S_{1,min}, \quad S_2 < S_{2,min}. \tag{2.10d}$$

Define

$$Q_j, \text{ iff } S_j \geq S_{j,min}, \quad j = 1, 2, \tag{2.11a}$$

$$NQ_j, \text{ iff } S_j < S_{j,min}, \quad j = 1, 2. \tag{2.11b}$$

We now have four cause-specific hazards which we, using an obvious notation, denote as $\theta_{Q1,Q2}$, $\theta_{NQ1,Q2}$, $\theta_{Q1,NQ2}$, $\theta_{NQ1,NQ2}$, e.g.

$$\theta_{Q1,Q2} = \lambda \Pr(Q_1, Q_2). \tag{2.12}$$

In (2.12) $\Pr(Q_1, Q_2)$ denotes the probability that a new hire meets both job requirements.

It is not difficult to show that the satisfaction (or not) of one job requirement is independent of the satisfaction (or not) of the other if and only if

$$\frac{\theta_{Q1,Q2}}{\theta_{Q1,NQ2}} = \frac{\theta_{Q1,Q2} + \theta_{NQ1,Q2}}{\theta_{Q1,NQ2} + \theta_{NQ1,NQ2}} \Leftrightarrow \frac{\theta_{Q1,Q2}}{\theta_{NQ1,Q2}} = \frac{\theta_{Q1,NQ2}}{\theta_{NQ1,NQ2}}. \tag{2.13}$$

If we can not reject this hypothesis, we conclude that employers do not substitute work experience for (formal) education when hiring new employees.

## 3. Data and estimation results

The data are from a two stage Dutch vacancy survey. First employers answered question about the job vacancies they had. About four months later employers were questioned about the vacancies that were filled in the meantime. We combine information on the hiring standards set by employers and the characteristics of the newly hired employees. Our subsample consists of 670 vacancies. Of these 494 (74%) were filled at the time of the second survey [more information on the data in van Ours and Ridder (1990b)].

For the 446 vacancies that were filled by the time of the second survey, and for which we know the characteristics of the new employee, we compare the job requirements and the qualifications of new employees. It turns out that 18% of the new hires do not have the minimally required work experience, and that 16% do not satisfy the job requirements with respect to education. Hence, education and work experience are only indicators of the productive characteristics that are really of interest to employers.

To investigate whether employers adjust job requirements if the vacancy remains open for a relatively long period or allow substitution of work experience and (formal) education we estimated a competing risk model with cause-specific hazards as in 92.12). Because only 10 vacancies had new hires that did not meet neither job requirement we estimated a model with only three cause-specific hazards. The estimation results are in table 1.

As could be expected, the probability that a new hire does not meet the educational requirement increases with the required level of education. However, this increase is similar if the new hire does not meet the required level of experience. The same holds for the required level of experience.

In filling commercial vacancies formal educational requirements are less important. It is remarkable that firms with a large number of employees attach less weight to job requirements. This shows that large firms do not 'solve' monitoring problems by setting high hiring standards. The estimates

Table 1
Parameter estimates competing risks model (standard errors)

| Variable | ≥ Exp, ≥ Educ | ≥ Exp, < Educ [a] | < Exp, ≥ Educ [a] |
|---|---|---|---|
| Constant | −5.42 (1.09) | −2.08 (5.26) | −2.09 (5.07) |
| Type of job | | | |
| Commercial [b] | 0.23 (0.15) | 0.73 (0.35) | 0.08 (0.32) |
| Industry [c] | −0.23 (0.19) | 0.76 (0.49) | −0.77 (0.52) |
| Required education (minimal level) [d] | | | |
| LO | 0.81 (0.29) | – | 0.13 (0.78) |
| LBO | 1.02 (0.21) | −3.55 (0.84) | −0.65 (0.51) |
| MBO | 0.48 (0.16) | −1.13 (0.35) | −0.28 (0.35) |
| Required experience | | | |
| No experience | 0.56 (0.14) | −0.20 (0.36) | – |
| Experience 0–2 yr | 0.21 (0.16) | −0.31 (0.50) | −0.13 (0.36) |
| Recruitment channels (at 1st interview) | | | |
| Advertisement | 0.07 (0.12) | 0.14 (0.31) | 0.01 (0.28) |
| Labor exchange | −0.02 (0.13) | −0.16 (0.35) | 0.18 (0.30) |
| Job characteristics | | | |
| Psychological test | −0.05 (0.15) | −0.52 (0.34) | −0.58 (0.34) |
| Part-time job | 0.08 (0.20) | 0.29 (0.58) | −0.32 (0.57) |
| Characteristics of establishment | | | |
| Number of employees | −0.20 (0.11) | 0.51 (0.20) | 0.25 (0.19) |
| Personnel department | 0.16 (0.13) | −0.56 (0.33) | −0.30 (0.29) |
| Applicants | | | |
| Number of applicants at first interview (/10) | 0.01 (0.02) | 0.06 (0.04) | 0.03 (0.04) |
| Vacancy duration | | | |
| 2–4 weeks | 0.73 (1.13) | – | – |
| 1–2 months | 1.35 (1.09) | 2.40 (5.14) | 2.87 (4.95) |
| 2–3 months | 1.68 (1.08) | 2.77 (5.14) | 3.46 (4.94) |
| 3–4 months | 1.64 (1.08) | 3.22 (5.13) | 2.94 (4.95) |
| 4–5 months | 1.80 (1.09) | 2.91 (5.14) | 3.30 (4.95) |
| 5–6 months | 1.92 (1.09) | 2.72 (5.15) | 3.89 (4.95) |
| > 6 months | 1.52 (1.01) | 2.85 (5.14) | 2.85 (4.95) |

[a] Estimates of difference coefficients of indicated cause-specific hazard and coefficients of cause-specific hazard in first column.
[b] Service, clerical or commercial job, Central Bureau of Statistics (CBS) job classification codes 3, 4, 5.
[c] Industry job, CBS job classification codes 6, 7.
[d] Level of education:
LBO: Lower vocational and lower general education
MBO: Intermediate vocational and intermediate general education
HBO/University: Higher vocational education and university

indicate that large firms rely less on job requirements and possibly more on the training fo new employees.

The estimation results show that very few vacancies are filled in the first month. This is in line with the results reported in van Ours and Ridder (1990a). After the first month the cause-specific hazards are almost constant. This shows that the hiring standards are not lowered if the vacancy remains open for a longer period. In other words, the job requirements are not used as an instrument to speed up the filling of the vacancy. Instead, employers stick to the initial job requirements, although they occasionally hire employees that do not meet these.

Except for the first month, during which few vacancies are filled, the probability that a new hire does not meet either job requirement is about 0.25. In the period that most vacancies are filled the probability that a new hire does not meet the educational requirement is larger than the probability that she does not meet the experience requirement. Hence, employers stick closer to the educational requirement than to the experience requirement.

Finally, we concluded that the two job requirements are indeed independent, by testing whether (2.13) holds, using a model without regressors. and assuming that the cause-specific hazards are constant after the first month.

## 4. Conclusions

In official statistics vacancies are usually classified by the required level of work experience and education. We have shown that 25% of all vacancies are filled by employees that do not meet one of these requirements. Employers put more weight on educational requirements than on the level of work experience. Moreover, education and work experience are not substituted, when hiring employees, i.e. an applicant that does not have the minimally required level of education, can not compensate this by having more work experience (and the other way around).

## References

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